

WHAT IS CLAIMED IS:

1. A shiftable toothed-belt drive comprising:

a drive set comprising at least two toothed gearwheels rotatable on axially parallel radially offset axes, the gearwheels being radially spaced at a distance from each other, each of the gearwheels having respective similarly shaped toothing;

a belt which extends around the gearwheels and the belt having internal toothing shaped for meshing with the toothing of the gearwheels;

an engagement and disengagement device positioned to act on the belt for selectively causing meshing of the toothing of the belt with the toothing on a first one of the gearwheels and for demeshing the belt from the toothing on the first gearwheel, the engagement and disengagement device being connected with the belt for lifting the belt radially from the first gearwheel from a meshed position into a demeshed position or for moving the toothed-belt radially so that the toothing thereon meshes with the toothing of the first gearwheel with the belt moving from the demeshed position into the meshed position.

2. The shiftable toothed-belt drive of claim 1, wherein the first gearwheel has axially opposite sides and the engagement and disengagement device comprises:

the belt having an inside toward the gearwheel and having an opposite outside;

a split belt pulley comprised of two pulleys, each pulley being respectively arranged at a respective axially opposite side of the first gearwheel and each pulley is respectively freely rotatable in relation to the first gearwheel, wherein the pulleys have axes of rotation which are in alignment with the axis of rotation of the first gearwheel;

each of the pulleys has an annular, radially outwardly facing, belt running surface which is oriented to descend radially in the direction toward the first gearwheel and toward the other one of the pulleys and the running surfaces being

oriented obliquely to the axis of rotation of the pulleys, wherein the belt running surfaces of the two pulleys define between them a generally V-shaped groove on which the toothed belt is received;

at least one of the two pulleys being arranged to be axially movable in relationship to each other and in relationship to the first gearwheel;

the engagement and disengagement device includes a disengager positioned and connected for acting on the pulleys and for applying a disengagement force which urges the pulleys axially in the direction toward the belt and for pushing the pulleys axially toward one another to an extent such that when the toothed belt is running on the belt running surfaces of the pulleys, the belt running surfaces of the pulleys raise the toothed belt radially from the first gearwheel for moving the belt at the first gearwheel from the meshed position to the demeshed position;

the engagement and disengagement device further comprising an engager selectively movable into contact with the outside of the toothed belt, the engager being moveable transversely to the rotation axis of the first gearwheel and being moveable for applying an engagement force to the outside of the toothed belt for tensioning the toothed belt to a sufficient extent that the belt pressure on the running surfaces presses the two pulleys axially away from one another to an extent that when the toothed belt runs on the belt running surfaces of the pulleys, the toothed belt becomes seated radially onto the gearwheel such that the toothed belt is moved from the demeshed position to the meshed position with the gearwheel.

3. The shiftable toothed belt drive of claim 2, wherein the disengager comprises a disengagement spring for generating a disengagement force to prestress the pulleys resiliently and elastically in the direction toward the gearwheel and toward each other, the engager having an actuating drive operable for generating an engagement force sufficient to overcome the resiliently elastic disengagement force.

4. The shiftable toothed belt drive of claim 2, wherein the engager includes an engagement spring sufficient for generating an engagement force to cause engagement of the belt with the first gearwheel and;

the disengager including an actuating drive operable for generating a disengagement force applied to the pulleys which is sufficient to overcome the resiliently elastic engagement force.

5. The shiftable toothed belt drive of claim 2, further comprising an input shaft and an output shaft;

a drive train between the input shaft and the output shaft, including a plurality of drive connections in the drive train, at least two of the drive connections each having at least one of the drive sets including a respective one of the engagement devices and a respective one of the disengagement devices;

each of the drive connections being operable at a different respective rotational speed step-up ratio or rotational speed step-down ratio for enabling torque to be transmitted between the drive shafts alternately via various ones of the drive sets which define different respective gear steps.

6. The shiftable toothed belt drive of claim 5, wherein the drive sets are connected to the input and output shafts for defining a specific direction of rotation of the output shaft with respect to the input shaft which is the same for all the drive sets.


7. The shiftable toothed belt drive of claim 5, further comprising at least one electric machine in the drive train and the machine being either a motor for driving the shafts or as a generator for being driven by the shafts.

8. The shiftable toothed belt drive of claim 7, wherein the electric machine is connected with the drive train for driving the drive train in a rotation direction opposite to a direction of rotation in which the drive train is operable by an internal combustion engine.

9. The shiftable toothed belt drive of claim 2, wherein the drive train is operable for use in a car, motorcycle, motorboat or motor ship.

10. The shiftable toothed belt drive of claim 5, further comprising a shiftable clutch in one of the drive trains, the clutch is operable for partially interrupting torque transmission by the clutch at a selected time, whereby a gear changing operation may be enabled.

11. The shiftable toothed belt drive of claim 10, wherein the clutch comprises a multiple disk clutch, including disks operable in a slipping mode with sliding friction, and the slipping mode being controllable as a function of selected operating criteria for enabling interruption and engagement of the clutch.

12. A shiftable belt drive comprising:   
a drive set comprising at least two toothed wheels rotatable on axially parallel radially offset axes, the wheels being radially spaced at a distance from each other;  
a belt which extends around the wheels and the belt being shaped for engaging the wheels;  
an engagement and disengagement device positioned to act on the belt for selectively causing engagement of the belt with a first one of the wheels and for disengaging the belt from the first wheel, the engagement and disengagement device being connected with the belt for lifting the belt radially from the first wheel from an engaged position into a disengaged position or for moving the belt radially to engage

the first wheel with the belt moving from the disengaged position into the engaged position

13. The shiftable belt drive of claim 12, wherein the first wheel has axially opposite sides and the engagement and disengagement device comprises:

the belt having an inside toward the wheel and having an opposite outside;

a pulley arranged at a respective axial side of the first wheel, the pulley is freely rotatable in relation to the first wheel, the pulley has an axis of rotation which is in alignment with the axis of rotation of the first wheel and the pulley is being arranged to be axially movable in relationship to the first wheel;

the pulley has an annular, radially outwardly facing, belt running surface which is oriented to descend radially in the direction toward the first wheel and the running surface being oriented obliquely to the axis of rotation of the pulley;

the engagement and disengagement device includes a disengager positioned and connected for acting on the pulley and for applying a disengagement force which urges the pulley axially in the direction toward the belt to an extent such that when the belt is running on the belt running surface of the pulley, the belt running surface of the pulleys raises the belt radially from the first wheel for moving the belt at the first wheel from the engaged position to the disengaged position;

the engagement and disengagement device further comprising an engager selectively movable into contact with the outside of the belt, the engager being moveable transversely to the rotation axis of the first wheel and being moveable for applying an engagement force to the outside of the belt for tensioning the belt to a sufficient extent that the belt pressure on the running surface presses the pulley axially away from belt to an extent that when the belt runs on the belt running surface of the pulley, the belt becomes seated radially onto the wheel such that the belt is moved from the disengaged position to the engaged position with the wheel.